MINNESOTA'S MAGIC ROCK

IRON ORE - Sinews of Industry

MILLIONS OF YEARS AGO, WHEN MINNESOTA WAS A LAND UNDER THE SEA, PARTICLES OF IRON FROM THE EARTH'S CRUST WERE DEPOSITED WITH SAND AND MUD ON THE BOTTOM.

AGES LATER, GREAT EARTHQUAKES CAUSED THIS GROUND TO SHIFT AND CRACK AND THE WATERS, PASSING THROUGH THE LAYERS, REMOVED THE SILICA AND LEFT POCKETS OF IRON OXIDE WHICH IS THE IRON ORE AS IT IS MINED TODAY.

THEN, GREAT GLACIERS MOVING DOWN FROM THE POLAR ICE CAP COVERED THE ORE BODIES WITH EARTH AND ROCK CALLED OVERBURDEN.

ON TOP OF THE OVERBURDEN GREW FORESTS; LAKES, HILLS AND VALLEYS WERE FORMED AND THE COUNTRYSIDE BECAME AS WE KNOW IT TODAY.

THOUSANDS OF YEARS LATER, THE FIRST WHITE MEN CAME TO THE LAKE SUPERIOR COUNTRY TO TRADE FOR FURS WITH THE INDIANS, UNAWARE THAT BENEATH THE VERY GROUND THEY WALKED ON LAY ONE OF THE NATION'S GREAT RESOURCES—

IRON ORE!

...SO, YOU SEE, BECAUSE OLD MOTHER NATURE SMILED ON US, ONE OF THE FINEST DEPOSITS OF IRON ORE BEING MINED IN THE WORLD TODAY IS RIGHT HERE IN MARVELOUS MINNESOTA!

OBSERVATION POINT

MESABI IR

YOU KNOW, WE'RE FARM FOLKS AND WE'VE ALWAYS BEEN AWARE OF WHAT GROWS ON THE TOP OF THE SOIL BUT WE SURELY HAD NO IDEA THAT ALL THIS WAS UNDERNEATH.

IT'S AN AWE-INSPIRING SIGHT, ALL RIGHT.

YES, AND TO THINK THAT IT ALMOST DIDN'T BELONG TO THIS COUNTRY!

ALMOST DIDN'T BELONG TO US? HOW COME?

WHEN I WAS STUDYING TO BE A MINING ENGINEER, I READ IN ONE OF MY BOOKS....

WHEN BENJAMIN FRANKLIN NEGOTIATED THE TREATY OF 1783 ENDING THE REVOLUTIONARY WAR, THE MITCHELL MAP, DRAWN IN 1755, WAS USED IN FIXING THE NORTHERN BOUNDARY. IT WAS NOT ACCURATE—PROBABLY BECAUSE OF THAT ERROR, IRON-RICH NORTHEASTERN MINNESOTA BECAME A PART OF THE UNITED STATES INSTEAD OF CANADA.

BOY, WERE WE LUCKY! WOW!

WHEN WAS THE FIRST ORE TAKEN FROM THIS RANGE, MR. NORRIS?

THIS IS THE MESABI RANGE, MISS SWANSON, AND THE FIRST MINE WAS LOCATED HERE IN 1890 BY THE MERRITT BROTHERS, "THE SEVEN IRON MEN".

THE HARDEST PART OF BUILDING THEIR MINE WAS THE RAILROAD TO LAKE SUPERIOR. OVERCOMING GREAT DIFFICULTIES, THE FIFTY MILES OF TRACK CARRIED THEIR FIRST TRAINLOAD OF ORE IN 1892.

WAS THAT THE REAL BEGINNING OF THE IRON ORE INDUSTRY IN MINNESOTA?

NO, IT WASN'T. THE FIRST ORE SHIPMENT CAME FROM THE VERMILLION RANGE IN 1884.

WHILE THE MERRITTS HAD SOME SMALL MACHINERY ON THE MESABI, A LOT OF THE WORK WAS DONE WITH PICKS, SHOVELS, MUSCLES AND HORSE-DRAWN WAGONS... THAT WAS HARD WORK AND FAR TOO SLOW.

THEN THE HORSES AND MULES WERE REPLACED BY THE "DINKY" ENGINES. GRADUALLY THE SIZE OF THE EQUIPMENT WAS INCREASED....

UNTIL TODAY WE ARE USING ELECTRIC SHOVELS WITH A 13-TON BITE TO LOAD ORE CARS THAT CARRY 70 TONS OF ORE EACH TRIP!

WHAT'S THAT STRANGE LOOKING MACHINE, MR. NORRIS?

THAT'S AN ELECTRIC BLAST HOLE DRILLING MACHINE, MR. SWANSON. IT DRILLS 9 INCH HOLES TO ANY DEPTH REQUIRED TO BLAST THE ORE SO IT CAN BE HANDLED BY THE SHOVELS.

I'LL BET THAT'S AN EXPLOSIVES TRUCK, ISN'T IT?

DANGER

LOOK AT THE LITTLE RED TRUCK, BILLY!

THAT'S RIGHT, BILLY. SEE, THE DRILLING MACHINE IS MOVING AWAY. NOW THE EXPLOSIVES MAN WILL PUT IN HIS CHARGES. LET'S WATCH HIM BLAST!

THERE IT GOES!

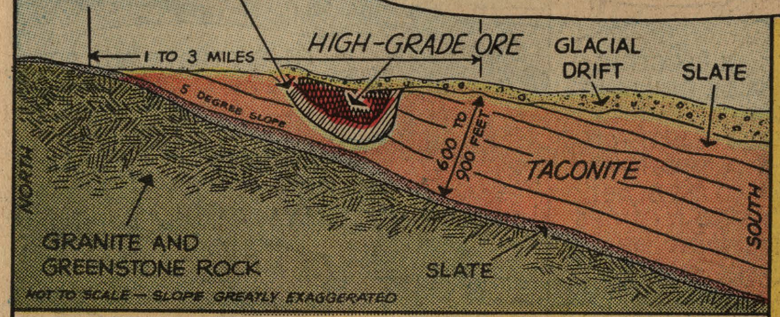
WOW!!

FIRE IN THE HOLE!!

NOW THE SHOVELS WILL LOAD THE ORE IN THE CARS AND IT'S ON THE WAY TO THE FURNACES TO BE MADE INTO IRON.

CAN ALL THE ORE BE SHIPPED DIRECTLY TO THE FURNACES?

OH, NO. MUCH OF IT IS TOO POOR. HERE IS A CROSS SECTION CUT-AWAY SHOWING ABOUT HOW THE ORE BODY OCCURS ON MINNESOTA'S MESABI RANGE. SEE HOW A POCKET OF GOOD ORE IS SURROUNDED BY A LOT OF LOW GRADE ORE AND TACONITE.



MOST OF THE ORE FROM OPEN PITS IS TOO COARSE OR TOO SANDY FOR DIRECT SHIPMENT, SO IT MUST BE TREATED.

WHAT A TREMENDOUS PLACE!

THIS IS A LARGE CRUSHING AND SCREENING PLANT WHICH SCREENS OUT THE ROCK AND CRUSHES THE ORE TO A SIZE FOR EFFICIENT HANDLING.

AND HERE IS THE PLANT WHERE THE LOW GRADE ORE IS WASHED AND TREATED TO MAKE IT USABLE.

I HAD NO IDEA THAT OPEN PIT MINING REQUIRED SUCH EXPENSIVE PLANTS AND MACHINERY. I THOUGHT YOU JUST SCOOPED IT UP AND SHIPPED IT.

OBSERVATION POINT MESABI RANGE

OH NO! THAT MAY HAVE BEEN TRUE IN THE EARLY DAYS; NOW IT GETS MORE COMPLICATED EACH YEAR AND UNDERGROUND MINING IS STILL MORE DIFFICULT AND EXPENSIVE.

UNDERGROUND MINES!! IN MINNESOTA??

WHILE WE HAVE SOME HERE ON THE MESABI, OUR BEST EXAMPLES OF UNDER-GROUND MINING ARE FOUND ON THE VERMILLION RANGE NEAR ELY. IF YOU HAVE TIME AND WOULD LIKE TO GO, I'D BE GLAD TO TAKE YOU UP THERE.

CAN WE GO, DAD? GEE!!

SURE ··· LET'S TAKE OUR CAR. MR. NORRIS, WILL YOU SUGGEST A GOOD PLACE TO HAVE LUNCH ALONG THE WAY.

THERE'S A GOOD PLACE TO HAVE LUNCH ON YOUR LEFT, MR. SWANSON.

SWELL- I'M HUNGRY AS A BEAR!

DID YOU ENJOY YOUR LUNCH?

JUST FINE. I'D LIKE THE CHECK, PLEASE.

THANK YOU, MR. SWANSON, SHALL WE GO?

WHAT'S THAT BIG STRUCTURE IN THE DISTANCE, MR. NORRIS?

THAT'S WHERE WE ARE GOING – THAT'S THE HEAD FRAME OVER THE SHAFT. IT HOUSES THE ELEVATORS AND THE "SKIPS"... AND THERE'S THE "DRY"... THAT IS WHERE THE MINERS HAVE THEIR SHOWERS AND CHANGE CLOTHES.

SAFETY FIRST

LOOK AT ALL THE MEN WEARING HARD HATS WITH THE LITTLE LIGHTS ON THEM,

THOSE ARE SAFETY HELMETS AND YOU'LL NOTICE THAT ALL THE MEN HAVE SAFETY GLASSES. SAY, THERE'S THE ONE MAN I'D LIKE YOU TO MEET – OH, JOE!

FOLKS, THIS IS THE MINE CAPTAIN, JOE RADIMOK. JOE, MEET THE SWANSONS. THEY'RE FROM THE SOUTHERN PART OF THE STATE... HERE ON VACATION.

HOW DO YOU DO, FOLKS?

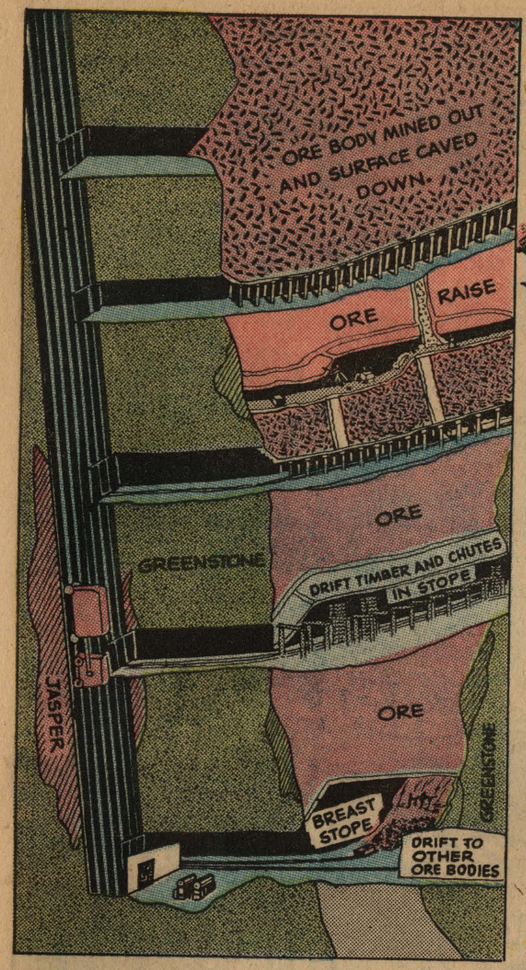
JOE, I'D LIKE YOU TO EXPLAIN THE MINE TO THE SWANSONS.

SURE, I'D BE GLAD TO. NOW, FOLKS, SINCE WE CAN'T ACCOMMODATE VISITORS DOWN BELOW, LET ME TELL YOU ABOUT IT.

NOW, THIS DRAWING SHOWS IN DETAIL THE MINE WE'RE STANDING ON.

YOU MEAN THAT THERE ARE MEN WORKING IN THE GROUND UNDER OUR FEET?

RIGHT, BILLY – SEVERAL HUNDRED MEN HARD AT WORK.



THIS IS THE ROOM AT THE END OF EACH DRIFT WHERE THE ORE IS ACTUALLY MINED. THIS MAN IS DRILLING THE HOLES TO BE FILLED WITH EXPLOSIVES TO BLAST THE ORE.

WHERE DO THE MEN GO WHEN THE EXPLOSIVES GO OFF, MR. RADIMOK?

THEY GO TO THE MAIN DRIFT WHERE THEY WILL BE COMPLETELY SAFE.

AFTER THE BLAST, THE ORE IS PULLED INTO A VERTICAL CHUTE BY AN ELECTRIC SCRAPER.

IT GOES DOWN TO THESE TRAM CARS ON A LOWER LEVEL AND IS HAULED BY ELECTRIC ENGINES TO THE SHAFT. HERE THE ORE AND ROCK WASTE ARE LOADED INTO "SKIPS" AND HOISTED TO THE SURFACE.

IS THIS ORE PROCESSED IN SOME WAY, TOO?

ONLY CRUSHED... THE ORE FROM THIS MINE CONTAINS VERY LITTLE WASTE MATERIAL. CRUSHING MAKES IT EASIER TO HANDLE.

DO YOU WORK ALL YEAR 'ROUND, MR. RADIMOK?

YES, WE DO. THE ORE MINED IN WINTER WHEN THE LAKES ARE FROZEN IS EITHER STOCK-PILED OR SHIPPED BY RAIL.

THAT'S ABOUT IT, FOLKS. THAT'S UNDERGROUND MINING IN MINNESOTA.

THANK YOU, MR. RADIMOK, FOR AN INTERESTING STORY.

YOU'RE VERY WELCOME. THANKS FOR COMING. GOOD BYE.

GEE, THAT WAS SWELL. I CAN HARDLY WAIT TO TELL THE KIDS BACK HOME!

YOU'LL HAVE A LOT TO TELL THEM, BILLY. MINNESOTA IS A MARVELOUS PLACE TO LIVE .... TO WORK AND TO PLAY. THERE'S NO FINER VACATION AREA IN THE COUNTRY THAN THIS ONE.

AH, FEELS GOOD TO SIT DOWN AGAIN. YOU DRIVE, MR. NORRIS, YOU KNOW WHICH WAY TO GO.

OH LOOK, WHAT'S THAT MACHINE, MR. NORRIS?

THAT'S THE NEW "JET DRILL." BY MIXING KEROSENE AND OXYGEN, A FLAME OF 4500 DEGREES IS OBTAINED – HOT ENOUGH TO BURN HOLES IN SOLID TACONITE!

TACONITE? WHAT'S THAT?

TACONITE IS THE ORIGINAL, UNCHANGED IRON BEARING ROCK. IT'S THE RAW MATERIAL THAT NATURE STARTED WITH WHEN SHE MADE IRON ORE.

HERE, TAKE A LOOK. SEE THOSE SPECKS OF IRON ORE IN THE ROCK. OUR JOB IS TO GET THEM OUT... AND IT'S PLENTY TOUGH TO DO!

WITH ALL THE NATURAL ORE AND IF IT'S SUCH A TOUGH JOB, WHY BOTHER?

LIKE ALL NATURAL RESOURCES, IRON ORE MUST BE CONSERVED SO IT WON'T RUN OUT. SOMEDAY, BILLY, THERE WILL BE AN END TO THE DIRECT SHIPPING ORE IN MINNESOTA, SO WE CONSERVE BY USING THE LOW GRADE ORES AND TACONITE.

WE UNDERSTAND CONSERVATION, MR. NORRIS. WE'VE BEEN PRACTICING IT FOR YEARS WITH OUR FARM LAND.

MR. NORRIS, DO YOU MEAN THAT THERE WILL COME A TIME WHEN OUR STATE WILL NO LONGER SHIP IRON ORE?

WE DON'T THINK SO, MRS. SWANSON. THERE ARE AMPLE RESERVES OF DIRECT SHIPPING AND WASH ORES TO INSURE THE STABILITY OF THE INDUSTRY DURING THE PERIOD OF CHANGE-OVER FROM OPEN PIT TO THE TACONITE PROCESS.

AND THE TACONITE IS PRACTICALLY INEXHAUSTIBLE, IS THAT IT?

EVEN THE PRESENTLY KNOWN SUPPLY IS ENOUGH FOR GENERATIONS TO COME.

MAY WE SEE THE TACONITE PROCESS IN OPERATION, MR. NORRIS?

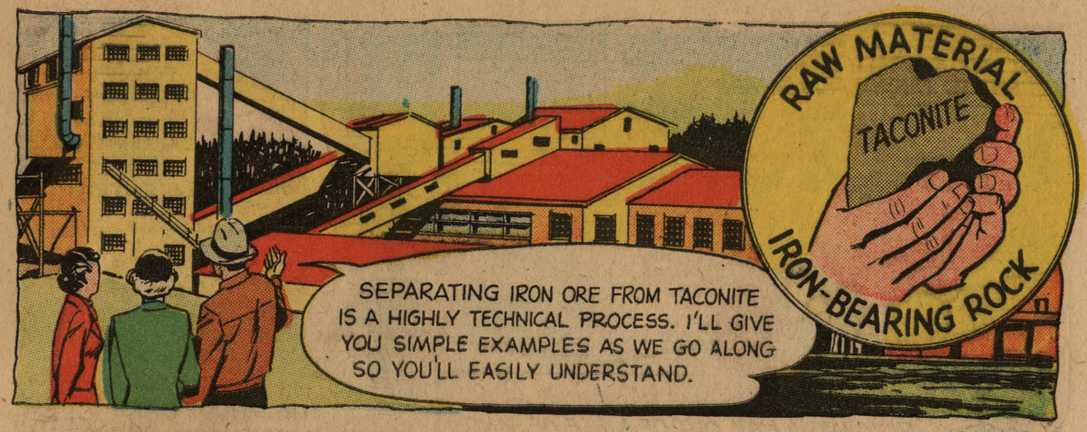
WE'RE QUITE CLOSE TO A PIONEERING TACONITE PLANT. SHALL WE DRIVE OVER?

THAT'S FINE WITH US, IF WE'RE NOT KEEPING YOU FROM SOMETHING YOU WANT TO DO.

NOT AT ALL. I WAS AT THE OBSERVATION STAND THIS MORNING BECAUSE IT'S MY DAY OFF - SORT OF A BUSMAN'S HOLIDAY.

THERE'S A BUNCH OF BUILDINGS UP AHEAD - IS THAT IT?

THAT'S IT, BILLY. AFTER THE TACONITE IS MINED, THE HUGE CHUNKS, SOMETIMES FOUR OR FIVE FEET WIDE, ARE BROUGHT HERE TO BE CONCENTRATED.


RAW MATERIAL
TACONITE
IRON-BEARING ROCK
SEPARATING IRON ORE FROM TACONITE IS A HIGHLY TECHNICAL PROCESS. I'LL GIVE YOU SIMPLE EXAMPLES AS WE GO ALONG SO YOU'LL EASILY UNDERSTAND.

BIG CRUSHERS REDUCE THE RAW STONE DOWN TO PIECES ABOUT ¾ OF AN INCH IN SIZE, JUST THE SAME AS IF YOU HIT IT WITH A HAMMER, ONLY ON A LARGER SCALE.

THE ROD MILL MIXES THE PIECES OF ROCK WITH WATER AND GRINDS THEM TO A COARSE POWDER.

WE'RE STILL JUST HAMMERING-MAKING LITTLE ONES OUT OF BIG ONES....

..THE SOUPY MIXTURE GOES THROUGH A MAGNETIC PROCESS WHICH REJECTS ABOUT 1/3 OF THE ROCK AS USELESS. REMAINING MATERIAL GOES THROUGH THIS CLASSIFIER WHICH SORTS OUT MATERIAL NEEDING MORE GRINDING.

IT IS THEN GROUND FINE AS POWDER IN THIS BALL MILL.

"JUST AS THE DRUGGIST USES HIS MORTAR AND PESTLE, THE BALL MILL GRINDS AWAY"

MAGNETIC SEPARATORS PICK OUT THE IRON ORE AND REJECT THE WASTE WHICH IS SENT TO DISPOSAL AREAS.

AT THIS POINT WE HAVE ONLY 1/3 OF THE ORIGINAL TACONITE ROCK NOW CALLED CONCENTRATE!"

EXACTLY THE SAME PRINCIPLE AS PULLING A NAIL OUT OF A PILE OF SAND.

THE MUDDY CAKE REMAINING GOES INTO THIS BALLING DRUM WHICH ROLLS IT INTO BALLS.

THEN, THIS IRON ORE CONCENTRATE GOES TO THE BIG FILTER, WHICH SUCKS OUT MOST OF THE WATER.

"IN THE SAME WAY YOUR VACUUM CLEANER SUCKS DIRT FROM A RUG, THE DRUM ABOVE REMOVES WATER FROM THE MIXTURE."

THESE BALLS ARE MARBLE SIZE.

THE LAST STEP IN THE PROCESS IS BAKING THE BALLS INTO PELLETS HARD ENOUGH TO STAND SHIPMENT AND USE IN THE BLAST FURNACES.

OTHER METHODS BEING USED PRODUCE SINTER OR NODULES INSTEAD OF PELLETS.

THE PELLETS, SINTER, OR NODULES, AFTER BEING BROUGHT TO THE DOCKS IN ORE CARS, ARE SHIPPED TO THE BLAST FURNACES, LIKE OTHER IRON ORES.

WELL, FOLKS, THAT'S THE STORY....THAT'S THE PAST AND PRESENT OF IRON MINING IN MINNESOTA. THE FUTURE IS IN THE HANDS OF THE RESEARCH MEN AND THE PEOPLE OF THE STATE.

WE'RE NOT ENGINEERS, MR. NORRIS, BUT WE ARE SOME OF THE PEOPLE.

THAT'S RIGHT, DEAR. WHAT CAN WE DO TO HELP THE FUTURE, MR. NORRIS?

THE FIRST STEP IS TO REALIZE HOW MUCH YOU DEPEND ON US AND WE DEPEND ON YOU.

IN OTHER WORDS, YOU FOLKS DEPEND ON US FARMERS FOR FOOD, AND WE DEPEND ON YOU TO BUY IT.

SIMPLY STATED, THAT'S IT. ANYTHING WHICH HELPS MINING ON THE IRON RANGES MAKES MORE JOBS AND MORE INCOME FOR THE REST OF THE STATE. IN NORTH-EASTERN MINNESOTA ALONE THERE ARE PROBABLY 250,000 PEOPLE DIRECTLY OR INDIRECTLY DEPENDENT ON MINING.

WHAT DOES ALL THIS TALK ABOUT COMPETITION WITH FOREIGN ORES MEAN TO THE PEOPLE OF MINNESOTA?

JUST THIS... IF STEEL COMPANIES CAN GET FOREIGN ORE CHEAPER THAN MINNESOTA ORE YOU CAN'T EXPECT OUR MINING OPERATIONS TO EXPAND.

DO YOU MEAN TO SAY THAT WOULD STOP ALL THESE NEW DEVELOPMENTS?

IT WOULD CERTAINLY TEND TO SLOW THEM DOWN. YOU DAIRY FARMERS ARE FACING A SIMILAR PROBLEM RIGHT NOW.

THAT'S A GOOD EXAMPLE, MR. NORRIS.

IS FOREIGN COMPETITION THE ONLY THREAT?

NO, OTHER STATES HAVE IRON ORE AND ARE FIGHTING FOR MARKETS, TOO.

IT LOOKS LIKE YOU HAVE THE SAME PROBLEMS WE HAVE... LABOR COSTS, TAXES, MACHINERY AND COMPETITION.

IT NEVER OCCURED TO ME, MR. NORRIS, HOW MUCH FARMING AND MINING ARE ALIKE.
NOR TO ME, MRS. SWANSON. YOUR HUSBAND HAS GIVEN ME SOME NEW IDEAS.
THE SWANSON FAMILY IS MIGHTY GRATEFUL TO YOU. THIS HAS BEEN THE BEST PART OF OUR TRIP...
NEXT TO FISHIN', DAD.
IT'S BEEN A REAL PLEASURE, FOLKS. ON YOUR WAY HOME YOU MIGHT DRIVE THROUGH DULUTH AND SEE THE BIG BOATS BEING LOADED WITH IRON ORE.
THAT'S A GOOD IDEA. THAT'S JUST WHAT WE'LL DO. THERE'S CERTAINLY A LOT TO SEE IN THIS GLORIOUS VACATION LAND.
WE'LL HAVE TO BE GETTING HOME, DAD.
OKAY, MOM...MR. NORRIS WHY DON'T YOU COME AND SEE US IN SOUTHERN MINNESOTA AND WE'LL SHOW YOU WHAT FARMING IS LIKE.
THANK YOU. ONE OF THESE DAYS I'LL DO JUST THAT.
WHEN I GROW UP, I WANT TO BE A MINING ENGINEER JUST LIKE YOU, MR. NORRIS, BUT WILL I HAVE TIME TO FISH?
THE MINES AND THE FISHING WILL BE WAITING FOR YOU, BILLY, IF WE MINNESOTANS USE GOOD JUDGEMENT AND ENCOURAGE CONSERVATION.
GOOD BYE, FOLKS.
GOOD BYE.
GOOD BYE.
THANKS AGAIN, MR. NORRIS.

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